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50X1

FINAL REPORT

Contract RD-77, Task Order "G"

Prepared for:

[redacted]

50X1

Report No. 544

3 November 1960

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I INTRODUCTION

This report describes the work that was performed by [redacted] 50X1 under Task Order "G". This task order called for the 50X1 manufacture of airborne leaflet dispensers which were to be fabricated essentially in accordance with the designs developed under Task Order "A". Under Task Order "A", designs were developed and one set of dispensers was fabricated and flight tested. Task Order "G" was executed so that two additional sets of dispensers, with minor improvements, would be on hand. Two types of dispensers were involved in this program. One type was carried internally within the bomb bay, was electrically operated and remotely controlled. Two ship sets of these dispensers were fabricated and delivered. The second type, referred to as the "Joe Hole" dispenser, was manually operated to expel leaflets through a flexible tube which was exposed to a negative pressure zone outside the fuselage of the aircraft. The requirement for this dispenser was cancelled before the units were fabricated. However, designs for this unit were completed and were delivered. 50X1

[redacted] Report No. 500, Volume I, presents a complete technical description of these dispensers and an account of their development. This Report No. 544 describes only the differences that existed between the prototypes that were furnished under Task Order "A" and the units that were furnished under Task Order "G".

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II GENERAL DESCRIPTION OF DISPENSERS

A. Bomb Bay Unit (Refer to Figure 1 and Drawing No. 290-301)

Figure 1 illustrates the right hand dispenser assembly and the cable rigging that was used to hoist the unit into the bomb bay of the aircraft. One ship set consisted of a right hand unit and a left hand unit. These two units, with a full leaflet load weighed approximately 6300 lbs. Each unit measures approximately 12'8" long x 3' wide x 3' high. Leaflets were contained in cells which extended the full width and height of the containers and which were approximately 4-9/16 inches in a fore and aft direction. Separators could be installed in these cells at spacing of 2", 4", 6", or 8" to accommodate leaflets of these various widths. The length of the leaflets was 5" so that when they were placed in the cells they would assume a curl as indicated in Figure 2. This curl tended to support the leaflet stack and thus minimize the bearing loads on the feed mechanism due to the weight of the leaflets. The curl also facilitated the design of the leaflet followers to prevent upward motion of the stack when negative accelerations were encountered. With the bomb bay doors open, leaflets were expelled out the bottom of the dispenser by parallel contra rotating rubber rollers which were driven by electric motors through speed reducers. Figure 2 illustrates the general arrangement of the leaflet stack in one cell. In addition to the two dispenser assemblies, one ship set of equipment included one power junction box, one bow observer's control panel, one pilot's override jettison control, one main control cable assembly, three copper bus bars, and one electric system test box. For a more detailed description of the dispenser assembly, its operation and accessory equipment, one should refer to [redacted] 50X1 Report No. 500, Volume I.

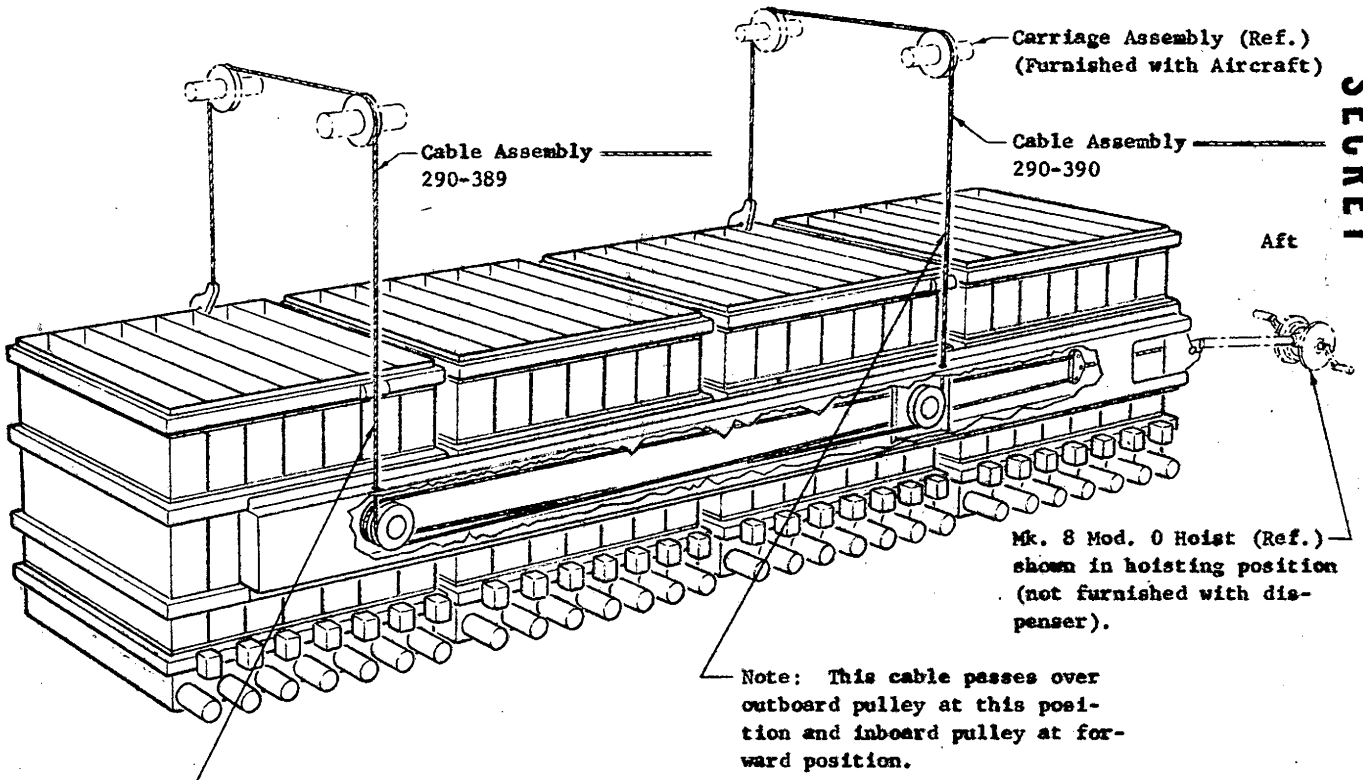

Figure 1. Sketch Illustrating Hoist Cable Rigging

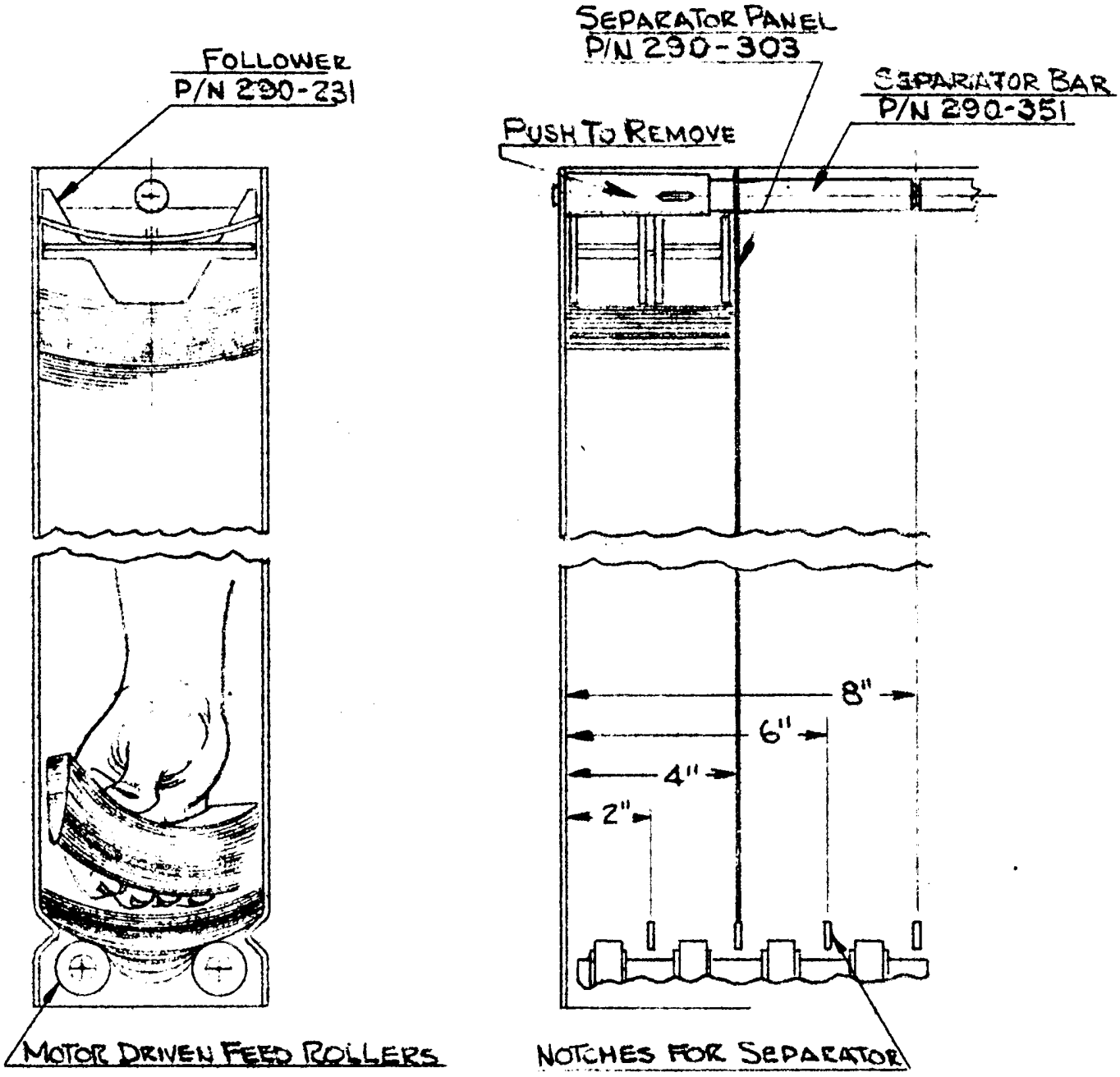

FIGURE 2 METHOD OF STACKING LEAFLETS

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B. "Joe Hole" Unit (Refer to Drawing No. 321-001)

Thus unit was designed so that it could be installed for operation while the aircraft was airborne. The unit could be installed in a well in the lower part of the fuselage structure aft of the bomb bay. When installed, a section of the device projected outside the lower surface of the fuselage into a low pressure zone. Thus, a pressure differential was created between the inside of the fuselage and the outside. This pressure differential was effective in exhausting leaflets from a container through the ducting and out the bottom of the fuselage. A length of flexible ducting permitted the operator to manipulate the suction nozzle inside the aircraft. The requirement for this unit was cancelled during the course of Task Order "G". Although designs for the unit were complete, fabrication of hardware for Task Order "G" was incomplete. However, changes to the "Joe Hole" dispenser which had been delivered under Task Order "A" were made in the field and these changes were incorporated in the designs under the Task Order "G" program. Also, replacement of the flexible duct were made under Task Order "G" to facilitate operation of the unit inside of the aircraft. Thus, the "Joe Hole" dispenser which was delivered under Task Order "A" by field modification and replacement of flexible ducting conforms to the designs prepared under Task Order "G". For additional information on the "Joe Hole" dispenser, one should refer to [redacted] Report No. 500, Volume I. 50X1

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III DESCRIPTION OF CHANGES MADE IN UNITS OF TASK ORDER "G"

A. General

During the development, manufacture and testing of the units covered by Task Order "A", it became evident that the detail designs which evolved from that project were not in each instance the most efficient from the standpoints of fabrication and service. Since Task Order "A" was undertaken as an accelerated program on a very short schedule, there was insufficient time to review many of the details and refine them to obtain the most efficient designs. With the inception of Task Order "G", it was mutually agreed that minor changes should be made in certain components of the dispenser assembly to improve certain operational features and facilitate manufacture. With these points in mind, the designs which were generated under Task Order "A" were reviewed and the following subassemblies and details were modified:

1. Deflector Assembly and Feed Assembly.
2. Dispenser Beam Assemblies.
3. Feed Weight Assembly.
4. Sway Brace Brackets and Suspension Members.
5. Caster Supports Structure.

The following discussion covers the significant differences in these assemblies between the units delivered under Task Order "A" and those delivered under Task Order "G". There are, however, minor differences in many of the detail parts of these assemblies which are not described.

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B. Detailed Description of Assemblies Which Were Changed

1. Deflector Assembly and Feed Assembly

One of the major changes made in the dispenser assemblies of Task Order "G" was in the design of the sheet metal deflector assemblies and the design of the feed assemblies. Changes in these components were considered desirable to facilitate fabrication and replacement parts.

In the prototype unit of Task Order "A", the feed assemblies (Drawing No. 290-201) were fastened in the bottom of the individual cells by eight bolts which passed through the sides of the angle side rails of the feed assemblies and mating holes in the lower edges of the walls of the cells. In this assembly arrangement, the axes of the eight bolts were oriented fore and aft. The deflector assemblies were located underneath the feed assemblies with the flanges of the deflector vanes positioned flat against the lower sides of the angle side rails. Subsequently, the strippers were located underneath the the vane flanges. With the components assembled in this order, all of the strippers (28 per cluster) and the deflector were attached to the feed assemblies with a common set of bolts and loose lock nuts. Thus, if it became necessary to replace a feed assembly, all 28 strippers had to be removed with the deflector assembly before the feed assembly could be removed. Furthermore, only the two end feed assemblies could be removed independent from the other feed assemblies of that cluster. If, for instance, the middle feed assembly had to be replaced, all of the feed assemblies forward or aft of the center had to be removed. The reason for this rather inefficient disassembly procedure was

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the fact that the needs for the deflector assemblies and the strippers were not discovered until the complete dispenser assembly had been flight tested. Rather than embark at this late date upon a lengthy redesign of the feed assemblies to accommodate the deflector and strippers more efficiently, these components were added in what appeared to be the most expeditious way to obtain the necessary performance.

When Task Order "G" was initiated, it was decided to redesign the lower section of the dispenser to facilitate fabrication and maintenance. This new design is reflected in Drawing Nos. 290-251, Feed Assembly; 290-259, Side Rail Assembly; 290-266, Deflector, and 290-260, Stripper. In the new design the strippers are incorporated as an integral part of the feed assembly and thus do not come off as loose parts when the deflector is removed. Also, by tapping the aluminum spacers between the individual cells at appropriate intervals, the feed assemblies could be attached by bolts which pass through the rail tabs (290-262). These attaching bolts are oriented with their axes vertically so that the feed assemblies can be removed individually. Furthermore, to simplify attachment or removal of the deflector, plate nuts were provided on the side rails of the feed assembly. This eliminated the difficult task of locating loose nuts behind the side rails when the deflector was being installed.

2. Dispenser Beam Assemblies

The dispenser assembly consists of four clusters of seven leaflet cells. Thus, each dispenser assembly consists of 28 cells. The cell clusters are joined together by two longitudinal beams, one on each side, which extend the full length of the assembly. In addition to securing the four clusters

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into a rigid assembly, these beams provide attaching points for suspension members and pulleys of the hoisting cables. Changes that were made in these beams involved only the methods of mounting nuts for the bolts which attach suspension members and sway brace brackets. In the units of Task Order "A", these nuts consisted of "Rivnuts" which were crimped into holes in the panels of the beam assemblies. A small number of these fasteners had become loose in the prototype units requiring difficult and time consuming replacement. In one or two applications, it was necessary to remove the 1/4 inch nuts and replace them with 5/16 inch nuts when the mounting holes became oversized or distorted. In order to remedy this problem in the units of Task Order "G" "Elastic Stop Nuts" were mounted on strips of aluminum sheet which could be inserted and installed through accessible openings in the beam assemblies. These "nut panels" are noted on Drawing No. 290-345 as Part Nos. 290-365, 290-366, and 290-367. This design represented an improvement, since; first, the stop nut appears to be more durable than the "Rivnut" for this particular application, and secondly, if one of the plate nuts should become damaged, it is a simple matter to remove the entire nut panel and install a new one. In the prototype of Task Order "A", 1/4 inch diameter bolts were used to attach the beam assemblies to the cluster assemblies. These were changed to 5/16 inch diameter bolts on the units of Task Order "G". This change was made to minimize the probability of stripping threads during installation of the beam assemblies and to obtain uniformity with outboard sway brace attachments.

3. Feed Weight Assembly

To assure that the leaflet stacks would feed downward as leaflets were ejected from the bottom of the stack, feed weights which rested on top of the stack were required. These weights were formed to bear downward on the middle

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of the stack and thus maintain the curvature of the leaflets which was necessary to obtain proper feeding and leaflet support. Rubber flaps which were fastened to the top of the weights permitted the weights to follow the stack freely, but prevented its upward movement when negative accelerations were encountered.

The feed weights of Task Order "A" were made from wood blocks and were approximately 3-3/4 inch wide, or slightly narrower than a 4 inch wide leaflet. These weights, because of their width, were suitable only for 4 inch or 8 inch leaflets. In dispensing 8 inch leaflets, two weights would be placed side-by-side on the top of each stack.

In order to provide greater flexibility in the size of the leaflets which could be accommodated and to assure proper weight action when wide leaflets were used, the weights were redesigned to a 2 inch width and were cast in aluminum alloy so that weights could be coupled together effectively. The weight assemblies of Task Order "G" were slightly less than 2 inch wide which made it possible to accommodate leaflet widths which were multiples of 2 inches rather than 4 inch. This made it possible to dispense leaflets of 2", 4", 6", or 8" widths. "Spirol" pins which were a hand press fit in the weight castings were used to couple the weights together for the wider leaflets. Thus, instead of having two loose weights to feed an 8" stack, for instance, four weights which were coupled together in a rigid assembly were used to obtain better weight action.

4. Sway Brace Brackets and Suspension Members

a. Sway Brack Brackets--In order to secure the dispenser assembly properly within the bomb bay, it was necessary to provide means of resisting lateral and longitudinal forces as well as vertical forces. Lateral and vertical forces were resisted by the suspension members. However, it was

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necessary to provide separate members to resist fore or aft movement of the dispenser. On the inboard side, these fore and aft sway braces were incorporated in the hanger bracket assemblies. On the outboard side, however, they were provided as separate brackets which were bolted to the beam assembly and the hat sections of the cluster assemblies.

By far the most severe loading condition was that which would occur in a ditching operation, at which time the forward decelleration could approach 20 g's. On the other hand, forward accellerations would be only 3 g's. Since resistance to movement in an aft direction was not critical, sway brace members could be redesigned to be more compatible with longttudinal load requirements and at the same time simplify fabrication. This was done only on the outboard sway brace brackets because the inboard sway braces were integral with the suspension brackets and redesign of these units would not have been warranted for the minor savings in fabrication costs that would have been realized.

On the dispenser units of Task Order "A" the outboard sway brace assemblies were relatively long members which were fabricated of alloy sheet steel. This length was required to utilize the normal hole patters of the beam assemblies. In this prototype unit the forward and aft outboard sway brace brackets were of different designs.

In the units of Task Order "G" the outboard sway brace brackets consisted of multiple installations of the universal bracket illustrated on Drawing No. 290-336. Two of these units were installed in the forward position opposing one another to provide resistance to forward or aft movement. A single unit was installed in the aft position to supplement the forward resistance of the front unit.

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b. Suspension Members--While testing the prototype units of Task Order "A", it was noted that the hanger link of the outboard suspension members normally rested in a position away from the surface of the dispenser assembly and caused some difficulty during the hoisting operation. To correct this difficulty, a spring clip was added inside the channel of the hanger bracket. When the hanger link was pivoted inside the channel, the hanger link pin could be snapped into the spring clip. This would hold the link retracted inside the hanger bracket assembly to prevent its interference with portions of the aircraft structure inside the bomb bay. When desired, the link could be manually removed from the clip to engage the suspension hooks of the bomb bay. Refer to Drawing No. 290-355 for this detail.

5. Caster Supports

Whereas the prototype dispenser of Task Order "A" was equipped with four casters to facilitate ground handling, the units of Task Order "G" were equipped with six. Also, the structure which supported the dispenser assembly off the casters was changed somewhat in Task Order "G". Drawing No. 290-391 shows the caster support assembly for the prototype unit. One assembly was located between the first and second cluster assemblies, and another was located between the third and fourth cluster assemblies. In this assembly, the caster spindle fitted into a turned aluminum alloy caster support where it was retained by a spring loaded plunger. This plunger retained the caster yet it allowed the caster to be removed easily when the dispenser was installed to avoid interference with the bomb bay doors when they were closed. These caster supports were bolted to two caster support angles which were bridged by a web of aluminum alloy. In cross section this assembly was channel shaped to fit between the end panels

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of adjacent cluster assemblies where it was retained by bolts. A third similar assembly which did not contain the caster supports was located between the second and third cluster assemblies to provide rigidity to the dispensdr assembly and to act as a shield to prevent leaflets from being blown upward into the space between these clusters.

The caster support structure was simplified in the units of Task Order "G" and a third pair of casters was added to the space between the second and third clusters. The turned caster support was replaced with an aluminum weldment which is shown on Drawing No. 290-270. These weldments were in turn bolted directly to the caster support angle assemblies and the web between the angles was eliminated. These support angles are shown on Drawing No. 290-264.

6. Interchangeability

The major subassemblies and components discussed above are not directly interchangeable with corresponding parts on the prototype units although the parts are dimensionally similar. The lack of interchangeability comes about through differences in the size and/or pattern of attaching fasteners in most cases. Exception to this statement will be found in the feed weights which are interchangeable between the prototypes and the units delivered under Task Order "G". If it should be necessary to replace components of the prototypes with their counterparts of the units of Task Order "G" the prototypes can be modified to accept these redesigned parts. Conversely, in most instances parts from the prototypes can be modified so that they can be installed on the dispensers of Task Order "G". Such modifications, however, should be made by qualified mechanics who have facilities available which will make it possible to change the

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components or assemblies so that structural and dimensional continuity is maintained. Cell dividiers, separator rods, and parts and assemblies of the electrical system are interchangeable between both sets of equipment.

C. Changes in "Joe Hole" Dispenser

Design changes in the "Joe Hole" dispenser, because of the basic simplicity of this unit, were considerably less extensive than the changes made in the bomb bay units. Changes made in the design of the "Joe Hole" dispenser of Task Order "G" were as follows:

1. The distance which the exhaust tube projected below the under surface of the aircraft was reduced from 18 ins. to 5 ins.
2. Three 7-ft. lengths of flexible ducting with coupling clamps were supplied instead of a single 15-ft. length.
3. Metal tabs with rubber grommets were provided along the the flexible ducts so that they could be suspended inside the aircraft and the operator thus relieved of the weight of the duct.
4. Provisions were made to permit the elbow of the dispenser to be rotated 30° either side of the ship's centerline to provide operating flexibility.

If the fabrication of the "Joe Hole" dispensers had been consumated under Task Order "G", these units would have been interchangeable with the unit developed under Task Order "A". However, the external configuration delivered under Task Order "G" must be followed to obtain proper performance.

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D. Other Modifications in Bomb Bay Units

1. In order to keep the dispenser assemblies in a level attitude transversely, it was necessary to provide offset cable guides at the top of the dispansers for the outboard cables. The purpose of these offset guides was to move the outboard cable inboard slightly to compensate for the weight of the drive motors and relays which were concentrated on the inboard side of the dispenser. It was noted by the customer after the prototype units had been delivered that the hoisting operation could be improved if the offset distance of these guides were increased. New guides as illustrated on Drawing No. 290-315 and 290-316 were fabricated to replace the guides which were furnished with the prototypes. Guides of this new design were also furnished with the units of Task Order "G".

2. After delivery of the prototypes, it was discovered that in order to test a dispenser assembly the unit had to be positioned underneath an aircraft close enough for connections to be made to the aircraft's power source and control units. In order to make it possible to check the units out in a shop or hangar when an aircraft was not available, an electric test box, Drawing No. 290-200, was furnished with each pair of dispensers. The input connector AN 3102E-16-11P would be connected to a 28 volt d.c. source such as an auxiliary power unit, and the output connector would be connected to the AN 3108E-16-11S connector on the electrical input cable which was a part of the dispenser assembly. The front panel of the test box contained a toggle lever for a combination switch and circuit breaker. Moving this lever to the "ON" position provided a closed circuit to the rotary switch. Movement of the rotary switch to any of the numbered positions would then cause the motors on the dispenser to operate in the same manner as operation of the Observer's Control Assembly. One electric test box was furnished for the prototype units and one test box was delivered with each of the two ship sets delivered under Task Order "G".

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3. During flight testing of the prototype units, the erratic airflow which occurred under the aircraft with the bomb bay doors open caused leaflets to be drawn into the bomb bay and deposited on cables, brackets, and structure of the aircraft and dispenser assemblies. Numerous attempts were made to incorporate shields and deflectors in the open areas which existed around the dispensers to prevent the circulation of air within the bomb bay, and consequently the passage of leaflets into the space around the dispensers. The largest space between the dispensers and the bomb bay opening was between the aft end of the dispensers and the aft bulkhead of the bay. It was felt that closing this opening with a sheet metal panel would prevent most of the air circulation and this the leaflet deposits in the bay. Such a panel was flight tested on various occasions and it was found that no apparent decrease resulted in the amount of leaflets deposited in the space around the dispensers. Consequently, there was no reason to provide such closures on the units of Task Order "G".

E. Operation and Maintenance Manual

Although the units of Task Order "G" differ from the prototype units as described in this report, no changes are necessary in the Operation and Maintenance Manual. The same manual may be used to service both sets of equipment.

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IV TABLE, COMPARISON OF RECOMMENDED SPARE PARTS

Part Name	Task Order "G" No. Req.	Task Order "G" P/N	Task Order "A" No. Req.	Task Order "A" P/N
Gear Box	4	290-450	4	290-401
Feed Weights	78	290-231	4	290-227
Separator Rods	4	290-251	4	290-351
Separator Panels	9	290-303	9	290-303
"Pip Pin" Assembly	1	290-379	1	290-379
Center Supports	4	290-206	4	290-206
End Plates	3	290-204	3	290-204
Bearings	10	S3KDD (Fafnir)	10	S3KDD
Rubber Rolls	300	290-223	300	290-223
Feed Assembly	2	290-251	2	290-201
Casters	4	H2681x187 (Bassik)	4	H2681x187
Knobs	3	KLK5507 (Kerrco)	3	KLK5507
Safety Pins	7	AN416-1	7	AN416-1
Roll Pins	50	52-012-094-0750 (Esna)	7	59-014-094-0625
"E" Rings	35	5133-37 (Waldes)	35	5133-37
Retaining Rings	30	5108-75	--	----
Connector	1	DD50P (Cannon)	1	DD50P
Pins	4	AN396-17	4	AN396-15